Minutes of Meeting
C37.100.7 Performance Evaluation of SF_6 Alternatives

10th Meeting, Burlington, VT Fall 2022, October 18th, 2022, 08:00 to 09:45 (EDT, UTC-4)

Chair: **Daniel Schiffbauer**
Vice Chair: **George Becker**
Secretary: **Victor Hermosillo**

Attendance:

Attendance: 56
Members, corresponding members:22/46, need 24 for quorum
Guests: 34

Quorum not reached 22 out of 46 members
Working group membership will be revisited to align with actual meeting attendance.

Introductions:

Attendees introduced themselves

Review of IEEE Patent and Copyright slides.

No essential patent claims reported.

Agenda:

Reviewed the agenda but no motion for approval since there was not quorum.

Motion to Approve Spring 2021 Meeting Minutes:

Minutes could not be approved because of lack of quorum.

Disbanding subgroups:

Subgroups working on different topics will be disbanded at the next meeting with quorum.

Outlook:

The project status was presented.

1. Results of Mandatory Editorial Coordination:
    a. Copyright permissions were obtained from CIGRE for common content.
    b. IEEE legal review is necessary and in process due to content on toxicity and environmental assessment.

c. Absolute verbiage edited in document text.
d. No comments on trademarks.
e. References in bibliography verified and completed.
f. Units were checked and corrected to correspond to IEEE Guidelines.
g. Graphics were replaced or upgraded, This activity will still be ongoing during balloting process.

2. Draft and Ballot:
    a. Guide has been restructured with an emphasis on guidance followed by technical supporting information.
    b. Document draft 4.0 completed.
    c. Makeup of the ballot group is balanced.
    d. Initial 30-day ballot & comment resolution process started. Ballot ends 11/04/2022.
    e. Comment resolution group is formed. SASB review afterwards.
    f. The status of the ongoing ballot as of 11/18/2022 is 17% reviewer response, 100% approval and no comments.
    g. Chair requested another user join the comment resolution group to improve balance. Chris Slattery volunteered.

3. PAR:
    a. Requested 2-year PAR extension to December 2024 to allow time to complete ballot process.
    b. PAR extension is on NesCom agenda for December 2nd, 2022.

Discussion of Contents

A guest requested to increase content related to technical air-insulated vacuum circuit breakers. Chair explained that relevant topics of this technology have already been addressed in the appropriate chapters. Chair reviewed, for example, the guidance table at the beginning of chapter 7 that includes both gas and vacuum since it is relevant to do so. Chair also indicated that air-insulated vacuum technology is only mentioned where relevant. For example, there is no need to discuss decomposition and/or liquefaction of air when neither phenomena occur in practice. Chair asked the guest (who is a member of the ballot group) to make a review comment and propose specific language for consideration by the comment resolution group.

Member indicated that the guide recommends changing the test order for capacitive switching testing for shunt capacitor bank application compared to C37.09. This standard indicated BC2 first then BC1. Current text suggests change in order to BC1 then BC2. Performing BC2 at rated pressure has the advantage of performing the first test at a higher current and included making operations. This test would then be followed by BC1 at lockout density with insulating gas already including decomposition products, for technologies that use gaseous medium for both interruption and insulation. Chair asked the member to incorporate their comment and proposed resolution into their ballot comments.

A main committee officer asked if the working group had received any requests from external entities. The chair advised that the working group had received no such requests.

General Topics:

None

Motion to Adjourn Meeting

Motion: Mike Crawford
Second: Carl Schuetz

Meeting was adjourned by the Chair.

Attendance:

Family Name	Given Name	Affiliation	10/18/2022
Aldakka	Qais	Los Angeles Department of Water and Power	
Almeida	Edwin	Southern California Edison	X
Aristizabal	Mauricio	Hitachi Energy	
Ashtekar	Koustubh	JST Power Equipment	X
Atere	Suraj	Exelon	
Ayers	Roy	Nashville Electric Service	
Baker	Daniel	LADWP	
Bannink	Herman	KEMA Netherlands	
Barbera	Steven	Arizona Public Service	
Becker	George	POWER Engineers Inc.	X
Beecher	Zack	Southern States LLC	
Beseda	David	S&C Electric Co.	
Bisewski	Bruno	RBJ Engineering Corp	
Boulus	Michael	PSE&G	
Boyce	Russell	Eaton Corporation	
Brown	Steven	Allen & Hoshall	
Brunke	John	POWER Engineers Inc.	
Bufi	Arben	Meiden America Switchgear, Inc.	X
Burse	Ted	Powell Industries, Inc	
Byron	Eldridge	Schneider Electric	
Cary	Stephen	Two Phase Solutions	
Chhabra	Mohit	S&C Electric Company	
Chiodo	Vincent	HICO	
Chovanec	Andrew	G&W Electric Co.	X
Cleaveland	Charles	Cleaveland/Price Inc.	
Collette	Lucas	Duquesne Light	X

Collette	Dave	Mitsubishi Electric	
Connor	Brad	Xcel Energy	
Cosby	Bianca	San Diego Gas & Electric	
Crawford	Michael	Mitsubishi Electric Power Products, Inc.	X
Crist	Daniel	Siemens Industry, Inc.	
Culhane	Michael	Eaton	
Cunningham	Jason	Southern States, LLC	X
Darko	Kennedy	G&W Electric Co.	X
Dhawan	Anil	ComEd	
Di Lillo	Patrick	Consolidated Edison Co. of NY, Inc.	X
Di Michele	Federico	CESI S.p.A.	
Door	Jeffrey	The H-J Family of Companies	
Duncan	Kirk	Hitachi T&D Solutions	
Dwyer	Bernie	PECO	
Edwards	Ken	FirstEnergy Corp.	
Edwards	Doug	Siemens Industry, Inc.	
Eftink	Emily	Burns & McDonnell	
Evans	Aaron	HICO America	
Fender	Karl	Southern States LLC	
Fennell	Howard	Nashville Electric Service	
Frazier	Raymond	Ameren	
French	Christopher	Eaton Corporation	
Frye	Richard	Eaton	
Gerzeny	Brian	Powell Electrical Systems Inc	X
Glaesman	Peter	PCORE Electric Company, Inc.	
Glinsky	Ilya	Southern California Edison	
Grahor	Lou	Eaton Corporation	
Hall	John	Tennessee Valley Authority	
Harley	Jackie	First Power Group LLC	
Hastreiter	Christopher	Eaton	
Heiermeier	Helmut	ABB	
Heintzelman	Travis	Burns & McDonnell	
Hensberger	Jeremy	Mitsubishi Electric Power Products Inc.	X
Hermosillo	Victor	GE Grid Solutions	X
Hester	Edward	Entergy	
Hohnstadt	Ben	DTE Energy	
Hu	Jingxuan (Joanne)	RBJ Engineering Corporation	
Hunter	Jennifer	MEPPI	X
Hutchins	Roy	Southern Company Services	
Hyjek	Katarzyna	DTE	

Hyoung Jin	JOO	Hyundai Electric	X
Irwin	Todd	GE Grid Solutions	X
Jacobs	Allan	Eaton Corporation	
Jagadeesan	Bharatwaj	Southern States LLC	
Jain	Rahul	S&C Electric Company	X
Jarnigan	Christopher	Southern Company Services	X
Jasinski	Joseph	ITC Holdings Corp.	
Jensen	Darin	Meiden America Switchgear, Inc.	X
Johnson	David	HVCB	
Johnson	Travis	Xcel Energy	
Jung	Wolfgang	Siemens AG	
Kandel	Jackie	Powell Industries, Inc	X
Kang	Jun	Hyundai Electric	X
Keels	Thomas	kEElectric Engineering	X
Kim	David	Hyundai Electric	X
Kim	SangTae	HICO America	X
Kim	jungdae	hyosung	
Kowalik	Peter	Cleaveland/Price Inc.	X
Kurinko	Carl	Hitachi Energy	X
Lanning	Scott	S&C Electric	
Lao	Billy	Dilo Company, Inc.	X
Laso Rubio	Andres	G&W Electric Co.	
Lavrinoff	Benedict	Kinectrics	
Leccia	Brad	Eaton	
LEE	JOOHYUN	HYOSUNG	
LEE	CHANG HOON	HYOSUNG Heavy industries	X
Lemmerman	David	PECO/Exelon	
Leopard	Dakota	Eaton Corporation	
Leufkens	Paul	Power Projects Leufkens	
Li	Jialin	Hydro One	X
Li	Wangpei	Eaton	
Ling	Yingjie	GE	
Liu	Hua Ying	Southern California Edison	
Lo	Benson	Toronto Hydro	
Lopez	Leo	WIKA Instrument, LP	X
Ma	Chunming	Burns and McDonnell	
Mannarino	Antonio	PSE&G	
Mantilla	Javier	Hyundai Electric Switzerland	
Marshall	Vincent	Southern Company Services	X

Martin	Donald	G&W Electric Co.	
Marx	Benjamin	Sargent and Lundy	
Marzec	Peter	S&C Electric Co.	
Mason	Douglas	ComEd	
Masterson	Paul	Meiden America Switchgear, Inc.	X
May	Steven	Southern Company	X
McCord	Neil	KEC Precision	
Meiners	Steven	Retired	
Methling	Ralf	Leibniz Institute for Plasma Science and Technology	
Midkiff	Jacob	Dominion Energy	
Milnikel	Henning	Siemens	
Monroe	Andrew	Southern Company	
Moran	Ashley	IEEE Standards Association (IEEE-SA)	
Mucha	Martin	G&W Electric	
Mulakken	Nikil	Facebook	
Natale	Anthony	HICO America	X
Nayar	Raj	Siemens	
Nelson	Jacob	HPS	
Nelson	Jeffrey	Tennessee Valley Authority	
ONeil	Brian	RMS Energy	
Owens	John	3M	
Palmer	Justin	ELECTRONSYSTEM MD	
Patel	Pathik	Duke Energy	
Pattison	Mark	H-J Family of Companies	
Pellerito	Thomas	DTE Energy	
Perrin	Damian	Entergy Services, LLC.	
Peterson	Mark	Xcel Energy	
Phan	Lise	Pacific Gas and Electric Company	
Phouminh	John	PEPCO HOLDINGS, INC.	
Polchinski	Craig	MEPPI	
Pruitt	Al	The Durham Company	
Putman	Larry	Powell	X
Ranjan	Rakesh	Esgee Tech	
Reid	Laura	Hubbell Power Systems	
Reit	Cristian	Doble Engineering Company	
Rexroad	Aaron	Meiden America Switchgear, Inc.	X
Ricciuti	Anthony	Eaton	
Rich	Bobby	Dominion Energy	
Riley	Caryn	Georgia Tech/NEETRAC	X
Ringham	Grant	BC Hydro	

Roberts	Brian	Southern States, LLC	
Rogers	Jon	Siemens Energy, Inc.	
Rohr	Richard	Powell Electrical Systems	
Rokser	Ian	Eaton Corporation	X
Rostron	Joe	Southern States LLC	
Ruebensam	James	S&C Electric Co.	
Salas	Oscar J.	Duke Energy	
Salinas	Alex	Doble Engineering Company	
Santos	Leonel	Schneider Electric	X
Savulyak	Victor	DNV GL KEMA Laboratory	
Sazanowicz	Robert	Avangrid - United Illuminating	
Schaben	Chase	Burns & McDonnell	
Schiffbauer	Daniel	Toshiba International Corporation	X
Schuetz	Carl	American Transmission Company (ATC)	X
Schumann	Jon	American Transmission Company	
Scott	Jeff	Ameren	
Sestito	John	Hyundai electric	X
Sharma	Devki	Entergy	
Shiller	Paul	First Power Group LLC	
Shinde	Sushil	Hitachi Energy	
Sicker	Robert	FirstEnergy Corp	
Siena	Matthew	Duke Energy	
Sims	Garett	Eaton Corp.	
Skidmore	Michael	AEP	X
Slattery	Christopher	First Energy	X
Smith	Kirk	Retired	X
Soulard	Francois	Hydro Quebec	X
Stage	James	Dominion Energy	
Steigerwalt	Don	Duke Energy	X
Stemmerich	Joe	Trayer Engineering Corp.	
Stoller	Patrick	Hitachi Energy	
Tabakovic	Dragan	Meramec Hubbell Power Systems	
Tarleton	John	Southern States, LLC	
Tillery	Tim	Howard Industries	
Torres	Jean-Marc	G&W Electric	
Toups	Vernon	Siemens	X
Trichon	Francois	Schneider Electric	X
Trost	Karla	G&W Electric	
Tuveson	Lars	Burns & McDonnell	

Usner	Joe	AEP	X
Uzelac	Nenad	G&W Electric Co.	X
van de Ligt	James	CANA High Voltage Ltd.	
Waldron	Mark	National Grid	
Ward	Jeffrey	Doble Engineering Company	
Webb	John	ABB	X
Weeks	Casey	Siemens Energy	X
Weisker	Jan	Siemens Energy	X
Wen	Jerry	BC Hydro	
Westerdale	Matt	Bureau of Reclamation	
Whitney	Michael	CSA America	
Wilkie	William	Eaton Corporation	
Wirz	Torsten	ABB AG	
Wolf	Robert	Hubbell Power Systems, Inc.	
Wolfe	Dan	MEPPI	X
Woodyard	Terrance	Siemens Industry Inc.	
Xiao	Ang	3M company	
York	Richard	Mitsubishi Electric Power Products, Inc.	X
Youssef	Mina	Eaton Corporation	X
Yu	Li	Eaton Corporation	X
Zaharko	Samuel	MEPPI	X
Zehnder	Lukas	Hitachi Energy	
Zhang	Wei	Southern Company	
Zhang	Jiong	MEPPI	
Zhong	Jim	American Transmission Company	
Zhou	Xin	Eaton Corporation	X

Meeting Presentation:

PC37.100.7 Guide for Performance Evaluation of SF_6 Alternatives

Fall Plenary Meeting: Tuesday, October 18, 2022

08:00 to 09:45 (EDT, UTC-4)

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Agenda

- Introductions
- IEEE copyright and patent policy review
- 46 members – 24 required for quorum
- Request approval of fall 2021 meeting minutes (attached)
- Request approval of March 2022 online meeting minutes (attached)
- Review and vote on approval of spring 2022 meeting minutes (attached)
- Disband subgroup of chapter 8
- Project status:
  - MEC and subsequent actions
  - Initial ballot of draft 4.0 in process
  - PAR extension requested: 2-year, December 2024
  - Comment Resolution Group established
  - Comment review
- Close

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Introductions

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IEEE Copyright and Patent Slides

IEEE Copyright

IEEE Patent

4

Fall 2021, March 2022, Spring 2022 minutes

F21ADSCOMx3RE V0

March 2022 Minutes

S22ADSCOMx2RE V0

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Subgroups

- Request motion to disband chapter 8 subgroup for the review of CIGRE D1.67 data.
  L. Yu, S. Shinde, C. Schuetz, V. Hermosillo, D. Johnson, J. Lopez
- Request motion to disband subgroup for review of Permeation Calculations
  A. Laso-Rubio, H. Milnikel, J. Owens,
- Request motion to disband subgroup for review of Definitions, abbreviations and acronyms
  James Stage, Dragan Tabakovic
- Request motion to disband subgroup for review of References
  Caryn Riley
- Comment resolution subgroup – need volunteers

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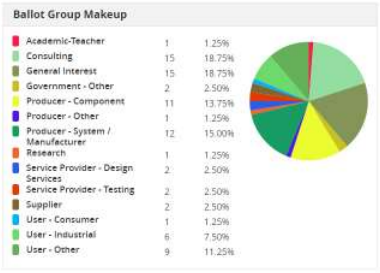
Subgroups

- Comment resolution subgroup
  - George Becker (eng., alt.)
  - Andy Chovanec (mfg.)
  - Mike Crawford (mfg.)
  - Todd Irwin (mfg.)
  - Mark Waldron (National Grid)
  - Terry Woodyard (mfg.)

MEC Summary

Ballot Group



- 80 ballot group members - balanced

Ballot Status and PAR Extension

- 17 Approve
- 0 Disapprove
- No comments
- Ballot closes 11/04

- PAR expires 12/31/2022
- Asked for 2-year PAR extension
- NesCom Agenda Date 12/02/2022

Adjourn

MEC Review Status:

The following action items were received from Mandatory Editorial Coordination of Draft 3.0 of PC37.100.7 on August 12, 2022. The working group is required to address these action items prior to initiation of the ballot. Each action item has been addressed as noted below and is reflected in Draft 4.0.

Section I action items and corrective actions to be completed before initial ballot:

COPYRIGHT[1]

Permission letters for borrowed content[2]

Copyright permission letters for borrowed text (including definitions), tables, and figures shall be submitted to IEEE prior to the start of ballot. Submit all copyright permission letters to your OPM Program Manager.

ACTION: We approved and archived the copyright permission letter from CIGRE, but I cannot determine which material in Draft 3.0 has been borrowed from CIGRE. Update the draft accordingly to clearly indicate CIGRE as the source of the borrowed material.

ACTION: Was Figure 16 borrowed from the COHSR?

Complete: ***All material referenced and/or borrowed from CIGRE is cited in the bibliography. In addition, standard attribution footnotes are added throughout the main body as requested here and as required by the Secretary General of CIGRE in their letter granting permission.***
All other borrowed material is from IEEE.
Figure 16 was not borrowed from COHSR. It was newly produced by the chapter author.

CONTENT

The draft shall be complete with no missing figures, tables, equations, text, etc.

ACTION: There are internal WG notes that are highlighted in yellow. Please make sure to remove those notes before the draft enters the SA ballot phase. For example, see: page 23, line 640, in subclause 5.3; page 23, line 655, in subclause 5.4.

Complete: ***All highlighted working group notes are addressed and consequently removed.***

Section II action items and corrective actions to be completed before final recirculation:

LEGAL REVIEW

Counsel's comments

The draft has been submitted to legal counsel for review. Counsel's comments will be shared with you during the initial SA ballot. Please incorporate counsel's changes into the draft, shown as tracked changes when the draft is recirculated to the ballot group.

NOT COMPLETE: ***Pending results of counsel's legal review.***

Absolute verbiage

Words making explicit or implicit guarantees should be modified if there is a possibility that unforeseen situations or circumstances may alter an outcome. "Ensure" might be changed to "help ensure," and "to prevent" might be changed to "to reduce."

ACTION: Review all instances of ensure and consider rewriting "ensure" with "…help ensure," "verify," etc.

Example

a) Any duty which includes a voltage condition check (VCC) should be performed in the minimum volume intended for service. This ~~ensures~~ verifies maximum decomposition prior to the VCC.

ACTION: Review all instances of prevent and consider rewriting "prevent" with "…help prevent," "reduce," etc.

Example

" and therefore require even more conservative design to help prevent ground faults from occurring."

ACTION: Review all instances of avoid and consider rewriting.

ACTION: Review all instances of always and consider deleting it.

ACTION: Review all instances of maximize and consider replacing with "improve."

ACTION: Review all instances of minimize and consider replacing with "reduce."

Complete: ***All instances of, "ensure", "prevent", "avoid", "always", "maximize" and "minimize" are replaced with less absolute verbiage.***

TRADEMARKS or SERVICE MARKS[3]

References to commercial equipment or products in a standard shall be generic and shall not include trademarks or other proprietary designations.

IEEE standards shall not include terms or conditions that are primarily contractual or commercial in nature, as opposed to technical or scientific in nature.

NOTE: This is boilerplate text, and I haven't identified any trademarks or service marks in Draft 3.0.

Complete: ***No action required.***

FRONT MATTER

The Introduction is informative and shall not contain requirements or technical recommendations.[4]

ACTION: Due to the recommendations in Table 1, move it from the Introduction (informative) to a normative area of text in the body of the standard.

Complete: ***Table 1 moved out of the front matter and into 1.2 Purpose.***

NORMATIVE REFERENCES and BIBLIOGRAPHY[5]

Normative references

References listed in Clause 2 shall be cited in normative text within the document so that their role and relationship is understood by the user for implementation of the standard.[6]

ACTION: IEEE Std C37.04 – Sometimes this reference is dated and sometimes it is shown with 2018. Citations to normative references need to be consistent with how the reference is listed in the normative references clause.

ACTION: IEEE Std C37.04-1999/Cor 1-2009 – I don't see a citation for this reference. Move to the bibliography or cite it in normative text

Complete: ***Dated references to C37.04 removed from the text.***
Also, IEEE Std C37.04-1999/Cor 1-2009 removed from normative references.

METRICATION

Standards submitted for approval should use metric units exclusively in the normative portions of the standard. Metric units ***shall*** be the primary unit of measurement where applicable. Inch-pound units may be included in parentheses after the metric units if the Standards Committee believes that the users of the document would benefit from the inclusion of inch-pound units, based on concerns for safety or clarity.[7,8]

ACTION: Convert non-SI units to SI units pers IEEE/ASTM SI 10.

1) The unit "bar" should be changed to kPa (bar = 100 kPa)
2) The unit "atm" should be changed to kPa (atm = 101.325 kPa)
3) The unit "cal" should be changed to J (cal = 4.184 J)

NOTE: Use nonbreaking spaces instead of a commas for numbers (e.g., 100,000 is changed to 100 000). After approval, commas will be replaced in figures, which will need to be redrawn, edited and proofed after approval, which may be time consuming.)

NOTE: Use numbers with abbreviated units. For example, change from "three microseconds" to "3 ms" These changes can be made after approval, but I want to bring it to your attention in case the WG decides to make these updates.

NOTE: Asterisks that are used to indicate "multiply by" will be replaced by multiplication symbols after approval.

Complete: ***Instances of "bar" and "atm" revised to MPa (not KPa).***
Found no instance of, "cal".
Replaced all instances of comma separation with nonbreaking spaces.
Replaced numbers and word units with numbers and abbreviated units.
Found no instances of an asterisk * used as a multiplication symbol.

GRAPHICS

ACTION:

1) Quality of line art and photos shall comply with minimum requirements for print reproduction.[9] Please avoid the use of color to convey meaning. Review all figures (e.g., Figures 7,13, 15, and 60) and consider that these figures may be printed in black and white. Update as necessary.

2) Font is difficult to read in some figures (e.g., Figures 12, 13, and 56).

Separate electronic files of figures shall be supplied (unless created in Microsoft® Word® or Adobe® FrameMaker®).

NOT COMPLETE: ***Most figures improved in general quality and readability.***
No remaining instances of color required to convey meaning.
However, some figures may still need to be improved for readability.

Dan Schiffbauer, PC37.100.7 working group chair
3 October 2022